

**Definition**

*Otalgia*, or ear pain, in or about the external ear and temporal bone may occur from multiple causes, many of which are remote from the ear itself. *Otorrhea*, or ear drainage, indicates inflammation of the external or middle ear or both. The otorrhea may be clear, sanguinous, mucoid, or purulent.

**Technique***Otalgia*

To ascertain the etiology of otalgia accurately, a detailed history relating to ear, dental, sinus, jaw, neck, tongue, mouth, and neurologic disorders in the head and neck region must be taken. Symptoms referable to one of these sites will usually point to the most likely etiology as listed in Table 122.1.

Acute, chronic, or recurrent pain may be present. The sensation may vary from a deep aching to a sharp, quick lancing discomfort. Only a vague fullness may be present,

**Table 122.1**  
Intrinsic Cause of Ear Pain

**Lesions of the external auditory canal**

Furuncle  
External otitis (eczematoid or swimmer's ear)  
Impacted cerumen or foreign body  
Traumatic effects (perforation from a slap on the ear)  
Herpes zoster  
Otomycosis  
Skin tumors, benign and malignant  
Granuloma of the ear  
Malignant otitis externa (in diabetes)  
Bell's palsy  
Bullous myringitis involving the canal  
Exostoses of the canal with obstruction  
Cholesteatoma and keratosis of the external canal  
Local manifestations of generalized skin disorders (psoriasis, lupus, leukemia, mycosis fungoides)  
Postradiation effects and postsurgical effects  
Parotid or soft tissue disorders extending into the ear canal

**Lesions of the middle ear**

Acute otitis media  
Otitis media with effusion (serous)  
Acute exacerbation of chronic otitis media with or without drum perforation  
Cholesteatoma  
Polyps arising from tympanum  
Acute mastoiditis  
Glomus jugulare tumor or other tumors  
Previous ventilation tube implant  
Spasm of middle ear muscles

or there may be a blocked feeling to the ear. Acute, sudden pain may be accompanied by fever, nasal congestion, nasal or ear drainage, or headache. Chronic pain usually exists by itself, and fewer associated complaints are noted. Tinnitus, dizziness, or hearing impairment are commonly seen with recurrent ear pain. The pain may seem deep and penetrating within the canal, or it may be more diffuse and extend either anterior or posterior to the pinna. The patient may volunteer that neck motion, chewing, swallowing, coughing, nose blowing, Valsalva maneuver, or flying aggravate or precipitate the discomfort.

Ear pain without obvious physical findings must be followed at periodic intervals until the source is located. Since 50% of patients have pain from dental sources, dental referral is often needed. Insidious dental infection or decay may be very difficult to identify, and this, as well as more remote causes, must often be pursued on more than one visit.

*Otorrhea*

A careful history is needed to determine environmental or factitious causes and familial disorders. The patient should be asked to describe the onset, duration, amount, and quality of the otorrhea. Questions should be asked as to the presence of childhood ear disease, trauma, possible foreign bodies, or assorted upper respiratory symptoms. Previous surgery to the ear, sinus, or pharynx should be noted. Questions about dermatitis in other areas of the body should be asked. Drug intake must be documented, and associated treatment with chemotherapy or radiation therapy must be noted. Excessive water exposure may be found.

The ear must be cleaned meticulously with small suction tips or wire applicators in order to permit adequate inspection and evaluation of the eardrum and middle ear. Mastoid x-rays may be needed to rule out associated middle ear or mastoid disease. Impedance audiometry may help in this determination also.

Studies for diabetes are needed in all chronic cases and in recurrent candida infections. All granular tissue should be biopsied.

**Basic Science***Otalgia*

Referred pain is an incompletely understood phenomenon wherein nerve impulses emanating from a distant or deeper structure are localized to a more superficial structure of the body. The site of pain referral generally follows the dermatomal rule. Well-known examples of this phenomenon are shoulder pain caused by diaphragmatic pleurisy and pain down the inner side of the arm and little finger of

cardiac origin. In each situation, the pain spreads from one area to another through nerve branches that have a common central origin within the same segments of the gray matter of the spinal cord.

Referred pain generally comes from viscera and muscles and is often described as deep pain. The faulty projection of deep pain to the surface is thought to be the result of infrequency of deep pain and inability to use vision to verify the source of stimulation; thus, learning appears to be an important factor in referred pain.

Evidence that reference of sensation is a learned phenomenon can be found in the clinical observation that a pain may be referred not to its usual point of reference but to a site of previous surgical operation, trauma, or localized pathologic process. Some individuals suffer severe pain localized to the teeth during high-altitude flying. Upon exclusion of every possible dental cause for pain, it was discovered that the pain stimulus was expansion of air trapped in the maxillary sinus. The group referring pain to the teeth had a high incidence of traumatic dental work on the side of reference, suggesting habit reference of pain. Under experimental conditions, it can be shown that a projection of pain is learned and that pain impulses conducted in overlapping pathways are simply given the previously learned reference for impulses in that path. Neither habit reference nor any other theory of referred pain can fully explain the phenomena that occur.

When pain is referred to the ear from a painful lesion elsewhere, it is likely that both the ear and the area containing the lesion receive sensory innervations from the same cranial nerve and that spread occurs by way of central connections within the gray matter of the brainstem.

The nerve supply to the external auditory canal and the middle ear comes from three cranial nerves; the trigeminal, glossopharyngeal, and vagus, and from the cervical plexus via the lesser occipital nerve (c2) and the great auricular nerve (c2-3). A small portion of the auricle, the superior and anterior walls of the external canal, and the anterior part of the tympanic membrane are supplied by the third branch of the auriculotemporal branch of the third division of the trigeminal nerve. Practically the whole surface of the auricle receives its sensory innervations from the great auricular and lesser occipital nerves. The inferior and posterior walls of the external canal and the posterior portion of the tympanic membrane are supplied with sensory fibers from the auricular branch of the vagus nerve. It is generally correct to state that the ganglionic representation of the sensation of the auricle and external canal can be divided into the gasserian ganglion in front, the second and third cervical ganglia behind, and jugular ganglion in between.

The tympanic plexus that lies on the promontory is formed mainly by nerves derived from the tympanic branch of the glossopharyngeal nerve but also receives branches from the geniculate ganglion of the facial nerve. Sympathetic branches from the carotid plexus join the tympanic plexus, although sensory function is doubtful. The skin overlying the mastoid is innervated by the mastoid branches of the great auricular and lesser occipital nerves, while cells in the mastoid receive their sensory supply through a mastoid branch of the tympanic plexus. Sensory branches from the trigeminal to structures within the middle ear are very questionable.

Referred pain pathways responsible for most cases of otalgia involve the same three cranial nerves that innervate the external auditory canal and middle ear. Painful impulses originating in the region of a diseased lower molar tooth

or temporomandibular joint would be traced by way of the gasserian ganglion to the spinal nucleus of the trigeminal (fifth cranial) nerve in the brainstem. This nucleus also connects with ear structures by way of other sensory branches of the third division that innervate the wall of the external canal and tympanum.

Irritative impulses from the tongue or tonsil travel through the glossopharyngeal (ninth cranial) nerve and its ganglia to enter the somatic sensory nucleus of that nerve within the medulla. This nucleus also receives the sensory branches of the ninth cranial nerve from the middle ear and adjacent structures. It is clear again, as in referred pain by the fifth nerve, that the pathway must pass through the sensory nucleus in the medulla.

In the same manner, the somatic afferent pathways of the vagus (tenth cranial) nerve from the larynx ascend through the peripheral ganglia to the spinal nucleus in the medulla and here connect with afferents from the concha and deeper structures of the ear.

The fifth, ninth, and tenth cranial nerves are closely related in their central connection in the brainstem; however, there must be a fair degree of separation within each of the three nerve systems centrally. Otherwise, the localized reference of pain observed clinically would not occur. Beyond a certain level of sensory irritation, there seems to be an overflow into the adjacent centers with more diffuse and poorly localized pain.

The onset, intensity, and duration of ear pain depend on the particular etiology. The cause of all persistent pain must be pursued intensely.

### *Otorrhea*

Both infection and trauma produce ear drainage. The various causes are listed in Table 122.2, and the reader is re-

**Table 122.2**  
Causes of Otorrhea

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**The most common causes:**

Liquid low-viscosity cerumen  
Otitis externa (swimmer's ear)  
Eczematoid dermatitis

**Other common causes:**

Psoriasis  
Neurodermatitis  
Basal cell carcinoma  
Purulent otorrhea from middle ear disease  
Foreign body (children)  
Furunculosis of ear canal  
Previous mastoid or middle ear surgery  
Candida (yeast otitis externa)

**Uncommon causes:**

Herpes zoster oticus  
Myringitis bullosa  
Malignant otitis externa (pseudomonas infections in diabetes)  
Otomycosis (true fungus, not candida)  
Radiation therapy to the cranial area  
Squamous cell carcinoma  
Old temporal bone trauma or surgery with CSF otorrhea  
Impacted keratosis of ear canal

**Rare causes:**

Benign and other malignant tumors of canal  
Middle ear tumors  
Perichondritis  
Tuberculosis or other granulomatous disease

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ferred to the reference list for a detailed discussion of each specific cause.

## Clinical Significance

### Otalgia

Pain in the ear may be divided into intrinsic and extrinsic causes denoting the site of origin. Intrinsic causes (Table 122.1) can usually be documented by direct examination of the ear.

Extrinsic causes produce pain in the ear reflex by lesions remote from the ear itself. This is often referred to as *reflex* or *referred otalgia*. In order to interpret the significance of referred pain in the ear, it is necessary to know the nerve supply of the ear and to know to what other organs the same or related nerves are distributed (see Basic Science). Lesions in the ear rarely produce pain in more distant areas, but many remote areas refer pain to the ear. When the patient complains of earache though having a normal external canal and drum, a number of sources of pain should come to mind. In about one-half of cases the cause will be of dental origin either occurring from the teeth themselves or from the temporomandibular joint. The joint is the most common site of pain, followed by the lower molar teeth.

Lesions of the anterior two-thirds of the tongue and inflammatory conditions of the parotid gland refer pain along the auricular branch of the auriculotemporal nerve. Referred pain from the submaxillary and lingual salivary glands via the lingual nerve may cause pain in front of the ear. An inflammation on the anterior one-third of the tongue may cause pain in front of the ear, whereas an ulceration of the posterior one-third of the tongue, such as a beginning carcinoma, may cause pain within the ear itself. This is explained by referral through two different nerve sources.

Patients with acute and chronic infections of the tonsils frequently complain of otalgia. Lesions of the palate, pharynx, or nasopharynx, especially in the region of the eustachian tube, often produce pain deep in the ear, and occasionally growths of the tonsil give rise to earache as the first and only symptom. Otalgia is often the earliest sign of a beginning malignancy in the nasopharynx. The ninth cranial nerve is involved in this referred pain pattern.

Ulcerative lesions of the entrance of the larynx such as tuberculosis or malignancy may cause reflex otalgia, secondary to irritation of the superior laryngeal branch of the vagus nerve.

The ear should be examined carefully. If no cause for pain can be found in that area, then the examiner should

think of the nerve supply of the ear and the mechanisms of referred pain. Think and check the letter "T":

Teeth	Trachea
Tongue	Temporomandibular joint
Tonsils	Tendons (hyoid, etc)
Tube (eustachian)	Tic (ninth nerve)
Throat	Thyroid

Acute and chronic forms of thyroiditis may present as throat and ear pain, but tenderness will be maximal over the thyroid lobe on that side. Inflammation of the carotid bulb (carotidynia) often presents in a similar manner.

An unsuspected source of otalgia is elongation of the styloid process with protrusion into the tonsillar fossa (Eagle's syndrome). Ear pain combined with throat discomfort should alert the examiner to palpate the tonsillar fossa.

### Otorrhea

The ear canal should be dry and clean in its natural state. Ear drainage except for liquid cerumen is always pathological.

## References

### Otalgia

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### Otorrhea

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